

What Is Claimed Is:

1. A semiconductor device comprising:
- a first insulating film comprising silicon nitride formed on a substrate;
- 5 a second insulating film comprising silicon oxide formed on said first insulating film;
- a semiconductor layer formed on said second insulating film wherein said semiconductor layer includes at least source, drain and channel regions; and
- 10 a gate electrode located over said channel region with a third insulating film comprising silicon oxide and a fourth insulating film comprising silicon nitride interposed therebetween wherein said third insulating film is in direct contact with said semiconductor layer.
2. A semiconductor device according to claim 1, wherein said
- 15 fourth insulating film is doped with hydrogen and oxygen.
3. A semiconductor device according to claim 1 wherein a thickness of said first insulating film is 10 50 nm, a thickness of said second insulating film is 10-800 nm, a thickness of said third insulating film is 50-200 nm and a thickness of said fourth insulating film is 2-20 nm.

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4. A semiconductor device comprising:
a first insulating film comprising silicon nitride formed on a substrate;

5 said first insulating film;

a semiconductor layer formed on said second insulating film wherein said semiconductor layer includes at least source, drain and channel regions;

10 semiconductor layer wherein said third insulating film extends beyond edges of said semiconductor layer so that said second third insulating films are in direct contact to each other;

15 a fourth insulating film comprising silicon nitride formed on
said third insulating film wherein said fourth insulating film covers said
semiconductor layer extends beyond side edges of the semiconductor layer;

a gate electrode formed over said channel region with said third and fourth insulating films interposed therebetween

5. A semiconductor device according to claim 4 wherein said fourth insulating film is doped with hydrogen or oxygen.

6. A semiconductor device according to claim 4 wherein a thickness of said first insulating film is 10-50 nm, a thickness of said

second insulating film is 10-800 nm, a thickness of said third insulating film is 50-200 nm and a thickness of said fourth insulating film is 2-20 nm.

7. A semiconductor device comprising:

a first insulating film comprising silicon nitride formed on a substrate;

a second insulating film comprising silicon oxide formed on said first insulating film;

a semiconductor layer formed on said second insulating film wherein said semiconductor layer includes at least source, drain and channel regions;

a third insulating film comprising silicon oxide formed on said semiconductor layer;

a fourth insulating film comprising silicon nitride formed on said third insulating film wherein said fourth insulating film covers said semiconductor layer except for a contact hole;

a gate electrode formed over said channel region with said third and fourth insulating films interposed therebetween,

wherein said source and drain regions are doped with hydrogen.

8. A semiconductor device according to claim 7 wherein said fourth insulating film is doped with hydrogen or oxygen.

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9. A semiconductor device according to claim 7 wherein a thickness of said first insulating film is 10-50 nm, a thickness of said second insulating film is 10-800 nm, a thickness of said third insulating film is 50-200 nm and a thickness of said fourth insulating film is 2-10 nm.

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10. A semiconductor device comprising:

a substrate;

a semiconductor layer formed over said substrate wherein said semiconductor layer includes at least source, drain and channel regions;

a gate electrode adjacent to said channel region;

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a first laminate structure interposed between said gate electrode and said channel region, wherein said first laminate structure includes a first insulating film comprising silicon oxide in contact with said channel region and a second insulating film comprising silicon nitride between said first insulating film and said gate electrode, and

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a second laminate structure including a third insulating film comprising silicon oxide and a fourth insulating film comprising silicon nitride wherein said channel region is interposed between said first and second laminate structures,

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wherein said third insulating film is interposed between said semiconductor layer and said fourth insulating film.

11. The semiconductor device according to claim 10 wherein said second insulating film comprising silicon nitride is doped with hydrogen or oxygen.

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12. A semiconductor device comprising:
a first insulating film comprising silicon nitride formed on a substrate;
a second insulating film comprising silicon nitride formed on
5 said first insulating film;
a semiconductor layer formed on said second insulating film wherein said semiconductor layer includes at least source, drain and channel regions;
a third insulating film comprising silicon oxide formed on said
10 semiconductor layer wherein said third insulating film extends beyond edges of said semiconductor layer so that said second and third insulating films are in direct contact to each other;
a fourth insulating film comprising silicon nitride formed on said third insulating film wherein said fourth insulating film substantially
15 covers said semiconductor layer except for a contact hole,
wherein said source and drain regions are doped with hydrogen.

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13. A semiconductor device according to claim 12 wherein a thickness of said first insulating film is 10-50 nm, a thickness of said second insulating film is 10-800 nm, a thickness of said third insulating film is 50-200 nm and a thickness of said fourth insulating film is 2-20 nm.

14. A semiconductor device according to claim 12 further comprising a gate electrode adjacent to said channel region.

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15. A CMOS semiconductor device having an N-channel type thin film transistor and a P-channel type thin film transistor, each of which comprising:

5 a first insulating film comprising silicon nitride formed on a substrate;

a second insulating film comprising silicon oxide formed on said first insulating film;

10 a semiconductor layer formed on said second insulating film wherein said semiconductor layer includes at least source, drain and channel regions;

a third insulating film comprising silicon oxide formed on said semiconductor layer;

15 a fourth insulating film comprising silicon nitride formed on said third insulating film wherein said fourth insulating film substantially covers said semiconductor layer except for a contact hole,

wherein the first and fourth insulating films comprising silicon nitride are both formed over a portion of said substrate between said first and second thin film transistors.

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16. A semiconductor device according to claim 15 wherein a thickness of said first insulating film is 10-50 nm, a thickness of said second insulating film is 10-800 nm, a thickness of said third insulating film is 50-200 nm and a thickness of said fourth insulating film is 2-20 nm.

17. A semiconductor device according to claim ¹⁵~~18~~ further comprising a gate electrode adjacent to said channel region.

18. A semiconductor device comprising:
a first insulating film comprising silicon nitride formed on a substrate;

a second insulating film comprising silicon oxide formed on a first insulating film;

a semiconductor layer formed on said second insulating film wherein said semiconductor layer includes at least source, drain and channel regions;

a third insulating film comprising silicon oxide formed on said semiconductor layer;

a fourth insulating film comprising silicon nitride formed on said third insulating film wherein said third and fourth insulating films cover said semiconductor layer;

a gate electrode formed over said channel region with said third and fourth insulating films interposed therebetween;

an interlayer insulating film comprising silicon oxide formed on said gate electrode and said fourth insulating film; and

at least one electrode formed on said interlayer insulating film wherein said at least one electrode is electrically connected to one of said source and drain regions via a contact hole opened through said interlayer insulating film and said third and fourth insulating films.

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19. A semiconductor device according to claim 18 wherein a thickness of said first insulating film is 10-50 nm, a thickness of said second insulating film is 10-800 nm, a thickness of said third insulating film is 50-200 nm and a thickness of said fourth insulating film is 2-20 nm.

5 20. A semiconductor device comprising:
a first insulating film comprising silicon nitride formed on a substrate;

a second insulating film comprising silicon oxide formed on said first insulating film;

10 a semiconductor layer formed on said second insulating film wherein said semiconductor layer includes at least source, drain and channel regions;

a third insulating film comprising silicon oxide formed on said semiconductor layer;

15 a fourth insulating film comprising silicon nitride formed on said third insulating film wherein said third and fourth insulating films cover said semiconductor layer;

an interlayer insulating film comprising silicon oxide formed on said fourth insulating film; and

20 at least one electrode formed on said interlayer insulating film wherein said at least one electrode is electrically connected to one of said source and drain regions via a contact hole opened through said interlayer insulating film and said third and fourth insulating films.

21. A semiconductor device according to any one of claim 1, 4, 7, 10, 12, 15, 18 or 20 wherein said semiconductor layer comprises crystallize silicon.

22. A semiconductor device according to any one of claim 1, 4,
5 7, 10, 12 15, 18 or 20 wherein said substrate is a glass substrate.